(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 149 768 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
31.10.2001 Bulletin 2001/44

(51) Int Cl.[7]: **B65B 31/02**

(21) Application number: **00830305.9**

(22) Date of filing: **20.04.2000**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(71) Applicant: **MO-EL S.r.l.**
I-42027 Montecchio Emilia (RE) (IT)

(72) Inventor: **Bertani, Carlo**
43022 Montechiarugolo(Parma) (IT)

(74) Representative: **Tansini, Elio Fabrizio**
C/O Bugnion S.p.A.,
Viale Lancetti, 17
20158 Milano (IT)

(54) Apparatus for the vacuum packaging of foods

(57) An apparatus (1) for the vacuum packaging of food comprises a vacuum chamber (3) for receiving a container for the food to be vacuum-packaged and an electrical resistance (13) movable between an active condition in which it abuts by pressure against the container portion to be heat sealed and an inactive condition in which it does not exert pressure on the container portion. The apparatus (1) further comprises a main air duct (22) to move the air between the outside and the inside of the chamber (3) along at least one air path of travel (21) lightly touching the electrical resistance (13) and a region of the container which is close to the portion to be heat sealed.

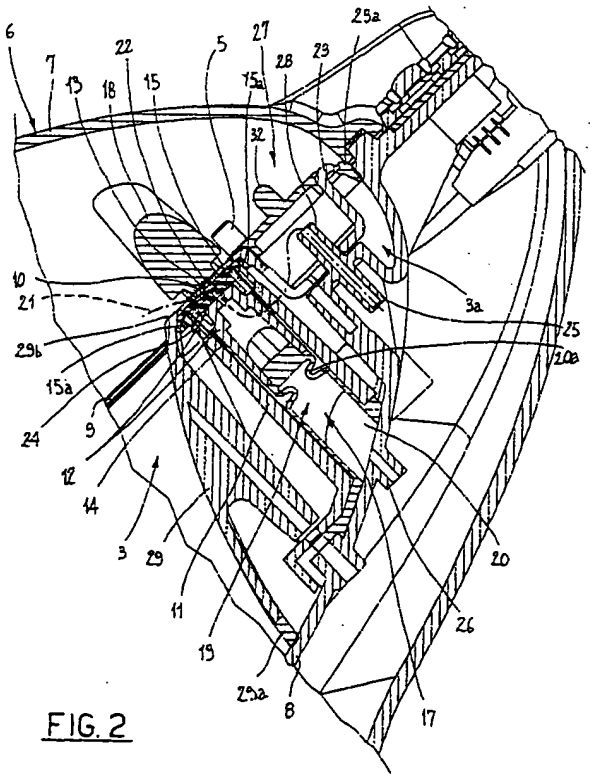


FIG. 2

EP 1 149 768 A1

Description

[0001] The present invention relates to an apparatus for the vacuum packaging of food, of the type comprising the features set forth in the preamble of claim 1.

[0002] It is known that there are different types of apparatus, in particular also adapted for home use, which are suitable to enable packaging of food under vacuum so as to ensure an optimal conservation of same over long periods of time.

[0003] The simplest apparatuses belonging to the known art comprise a pump connected through a suction duct with an end piece to be operatively brought into engagement with a container in which the vacuum is to be created.

[0004] In apparatuses intended for packaging of food in rigid containers, the end piece generally consists of a rubber nozzle to be sealingly coupled to a seating arranged in a single-acting valve associated with the container.

[0005] In may cases however it is preferable for the food to be packaged in containers of a simpler structure, such as envelopes or bags of plastic material which have a smaller bulkiness than rigid containers.

[0006] There are for the purpose apparatuses that, in addition to the pump and the sucking end piece, comprise a bag-closing member and a heat-sealing system for the bag. Packaging involves insertion of the sucking end piece into the bag opening disposed on a work top. Then the air contained in the bag is drawn out. During this step the bag opening is maintained tightly closed, behind the sucking end piece, by the closing member.

[0007] When suction is over, the bag is definitively sealed by a heat seal carried out in front of the sucking end piece by means of an electric resistance against which the bag opening is pressed by means of a pressure bar.

[0008] An important drawback of these devices resides in that, during the sucking step, the bag walls often adhere to each other, thereby separating the sucking end piece from air pockets that are still present in the bag.

[0009] Disclosed in document US 5,239,808, to which reference is herein made as being the most pertinent state of the art, is an apparatus comprising a vacuum chamber which is accessible through an upper door and is adapted to receive a bag containing the food to be vacuum-packaged. A duct brings the chamber into communication with a sucking pump. Also present within the chamber is an electrical resistance which can be switched over and is movable between an inactive condition in which it does not engage the bag and an active condition in which it exerts pressure against the bag opening.

[0010] When the pump is operated, the vacuum is created in the chamber and consequently in the bag. Since the bag is in a vacuum environment, the presence of air pockets within this environment is avoided. Then the resistance is pressed against the bag opening and power supplied over a given period of time in order to heat seal the bag.

[0011] In accordance with the present invention, it has been however found that this device, like those of the previously described type, involves some important disadvantages.

[0012] First of all, if several packaging operations are carried out at a short distance of time from each other, the thermal inertia leads the resistance and the insulating material carrying it to reach increasingly higher operating temperatures. Let us suppose, for example, that during the first packaging a passage of current in the electrical resistance for a period of "n" seconds brings this resistance from the room temperature to a temperature t1. When the second packaging is carried out the starting temperature of the resistance will be higher than the room temperature due to the preceding heating. A passage of current for the same "n" seconds will therefore make the resistance reach a temperature higher than t1.

[0013] The above-illustrated phenomenon makes it difficult to control the operating temperature of the resistance. Therefore the latter can burn the bag or at all events carry out a faulty heat seal.

[0014] Another drawback resides in the fact that, when the bag is taken out of the vacuum chamber, the heat-sealed portion of same is still at a high temperature. Thus, the bag can be hardly handled because its hot portion can be readily deformed being still partly in a melting state. Under these conditions the sealed portion is easily subject to unsticking and tearing, which will make the vacuum packaging fruitless.

[0015] In the light of the above, it is an object of the present invention to provide an apparatus for the vacuum packaging of food which is capable of solving the above mentioned drawbacks.

[0016] In particular, the main task of the present invention is to ensure an optimal heat sealing of the food container, even in the case in which more packaging operations in sequence are carried out.

[0017] Another object of the invention is to devise an apparatus capable of, at the end of the packaging process, providing a container for vacuum-packaged foods which can be immediately handled without particular precautions being required and which is not subject to the risk of being torn.

[0018] The technical task mentioned and the aims specified are substantially achieved by an apparatus for the vacuum packaging of food in accordance with the features recited in the appended claims.

[0019] Description of a preferred but not exclusive embodiment of an apparatus for the vacuum packaging of food is now given hereinafter by way of non-limiting example with reference to the accompanying drawings, in which:

- Fig. 1 is a longitudinal section view of the apparatus

of the invention;

- Fig. 2 shows a section of a detail of the apparatus in Fig. 1 to an enlarged scale;
- Fig. 3 is a perspective view of the apparatus of the invention;
- Fig. 4 is an exploded view of a component of the apparatus in Fig. 3;
- Fig. 5 shows a section of the apparatus in Fig. 3 taken along line V-V in Fig. 3.

[0020] With reference to the drawings, the apparatus for the vacuum packaging of food in accordance with the invention has been generally identified by reference numeral 1. The apparatus comprises a conveniently shaped base 2 so that it can be steadily positioned on a horizontal rest surface.

[0021] Base 2 carries a vacuum chamber 3 adapted to receive a food container having a portion to be heat sealed.

[0022] The container, not shown in the figures, preferably consists of an envelope (or bag) made of plastic material or the inside surface of which is covered with plastic material, and open on one side. The envelope, close to the open side thereof has a pair of holes the shape of which matches that of two protrusions 4, 5 present in the vacuum chamber. Engagement of the envelope takes place by fitting the holes on these protrusions 4, 5.

[0023] The vacuum chamber 3 has an inclined extension direction, just as an indication at an angle of at least 30° and preferably in the order of 45° and greater with respect to the horizontal rest surface 2a of base 2. This enables an upward orientation of the container opening to be sealed, so that the packaged foods are prevented from coming out.

[0024] Chamber 3 also has an opening 9 for introduction of the food container to be vacuum packaged. The opening can be hermetically closed by an appropriate lid 6.

[0025] In particular, in the embodiment described, chamber 3 is made up of two shell halves 7, 8. The lower shell half 8 is mounted to the base 3 whereas the upper shell half 7 is hinged on the lower shell half 8. In this case opening 9 through which the food container is inserted in chamber 3 is obtained by lifting the upper shell half 7 from the lower one 8, lid 6 being embodied by the upper shell half 7 itself.

[0026] Means 10 to seal the container by heat sealing is active within the vacuum chamber 3, as seen in detail in Figs. 2 and 5. This means comprises a holding frame 11 having side walls consecutively disposed in a closed perimetric line.

[0027] Frame 11 is mounted on the lower shell half 8 and surrounds a support 12 to which an electrical resistance 13 is mounted. Finally said resistance is covered, on its side opposite to support 12, with an interchangeable film 13a of PTFE (polyethylene terephthalate) or other heat-resistant and adhesion-preventing material.

[0028] Said heat-resistant and adhesion-preventing material can be subject to deterioration over time due to its being used plenty of times at high temperature.

[0029] To make film 13a easily replaceable, appropriate hooking elements 33 and 34 which are fixed with respect to the electrical resistance, have been arranged in the vacuum chamber 3, and fitted on these elements are the respectively opposite ends of the film strip 13a, conveniently provided with holes for the purpose. Two clips 35, 36 that can be each removably engaged on one of the hooking elements 33, 34 prevent accidental disengagements of the film 13a.

[0030] Support 12 comprises a rigid element 14 and a body 15 of deformable material, silicone for example. Said body 15 has one or more perimetric tailpieces 15a getting hermetically in engagement with the upper edge 16 of frame 11, preferably over the whole perimetral extension of the upper edge itself.

[0031] The electrical resistance 13 and support 12 are movable between an active condition in which the resistance 13 abuts by pressure against the container portion to be heat sealed and an inactive condition in which the resistance 13 does not exert any pressure on the container.

[0032] The sealing means for the container further comprises a counter-bar 18 mounted at the inside of the vacuum chamber 3, on the upper shell half 7. Positioning of bar 18 takes place in such a manner that the resistance, when it is in its active condition, pushes the container portion to be heat sealed against the counter-bar 18 itself.

[0033] Means 17 to switch over the electrical resistance 13 between its inactive condition and its active condition is placed within frame 11, under support 12. This means 17 comprises a pneumatic actuator 19 having a control chamber 20. Chamber 20 is of variable volume depending on the pressure difference between the control chamber itself and the vacuum chamber 3.

[0034] In particular, the control chamber 20 has a movable portion 20a, preferably consisting of a deformable diaphragm on which support 12 is mounted.

[0035] The apparatus of the invention further comprises pneumatic means operatively active in the chamber to move the air between the inside and outside of the chamber itself along at least one air path of travel 21 (identified in chain lines in Figs. 1 and 2). The air path of travel 21 extends at least partly along a main air duct 22.

[0036] The same path 21 lightly touches both the sealing means 10 and the container region close to the portion to be heat sealed. For this reason the means 10 for tightly closing the container by heat sealing is advantageously located close to the main air duct 22.

[0037] Duct 22 is formed at least partly within support 12. In more detail, the duct 22 portion extending within the body 15 of deformable material comprises a longitudinal channel 23, clearly shown in Fig. 4. A series of side channels 24 branch off from this longitudinal chan-

nel 23 and they are in communication with the inside of the vacuum chamber 3.

[0038] Advantageously, the electrical resistance 13 constitutes at least one portion of the inner wall of the main air duct 22. In particular, in the embodiment herein described, the electrical resistance 13 defines an upper confining wall of the longitudinal channel 23 and the side channels 24.

[0039] The pneumatic means comprises a pump 37, of known type and therefore only diagrammatically shown in the drawings, to draw the air out of the vacuum chamber 3. Pump 37 can be housed for example in base 2 and is connected with a nozzle 25 ending in a pre-chamber 3a delimited within chamber 3 by a holding framework 29 the perimetral edges of which are sealingly engaged, by a gasket 29a, against the inner surface of the lower shell half 8 of the chamber itself. The holding framework 29 at the upper part thereof has a rest surface 29b substantially coplanar with the junction line between the lower shell half 8 and the upper shell half 7 and carrying said protrusions 4, 5, and hooking elements 34, 35 positioned close to the opposite ends of a through slit 30 through which the sealing means 10 appears and under the perimetral edge of which the body 15, made of deformable material, of the support 12 sealingly engages. The pre-chamber 3a is therefore brought into fluid communication with the vacuum chamber 3 through the main air duct 22.

[0040] The pneumatic means further comprises a first valve 38 active on the main air duct. The first valve 38, consisting of a three-way solenoid valve of known type for example, can be switched over between a first operating condition in which it brings pre-chamber 3a, and consequently duct 22, into communication with pump 37 and a second condition in which it brings duct 22 into communication with the environment external to the vacuum chamber 3.

[0041] In addition to the main duct 22, the described apparatus comprises a secondary air duct 26 bringing the control chamber 20 into communication with a second valve 39.

[0042] In the same manner as the first valve 38, the second valve 39 can be switched over between a first operating condition in which it brings duct 26 into communication with pump 37 and a second condition in which it brings duct 26 into communication with the surrounding atmosphere.

[0043] Apparatus 1 may further comprise auxiliary means 27 to create the vacuum in containers external to the vacuum chamber 3. This means 27 comprises a suction end piece 28 disposed in the extension of nozzle 25 within pre-chamber 3a, and accessible through a connecting opening 31 arranged in the holding framework 29 and provided with a small cover 32 that can be removed or opened.

[0044] Therefore, after removal of cover 32, access to the pre-chamber 3a is made possible for carrying out, at opening 31 or directly on the end piece 28, connection of a connecting element disposed at the end of a flexible tube the other end of which lends itself to be connected, in a manner known per se, to a valve associated with a suitable container for the vacuum packaging of food, which container is external to the vacuum chamber 3.

[0045] Operation of the apparatus of the invention described above mainly as regards structure, is as follows.

[0046] The container in the form of an envelope, into which the food to be packaged under vacuum has been previously introduced, is inserted in the vacuum chamber 3 through opening 9. The container is then fastened to the lower shell half 8, by fitting the container holes, arranged close to the open side thereof, on the respective protrusions 4, 5 arranged on the rest surface 29b of the holding framework 29. The upper shell half 7 at this point is closed so that the volume inside the vacuum chamber 3 is hermetically isolated from the surrounding environment.

[0047] The first and second valves 38, 39 are such arranged that they bring the main air duct 22 and duct 26 respectively into communication with pump 37. The latter is started, by means of a push-button 40 operated by the closure of lid 6 for example, so as to create the vacuum in the pre-chamber 3a and the control chamber 20. The vacuum created in the pre-chamber 3a causes suction of the air contained in the vacuum chamber 3, through the path of travel 21. Consequently, also the air present in the container is drawn out of the latter. The air from the container and the vacuum chamber 3 is thus obliged to lightly touch the electrical resistance 13 which is in its inactive condition. If the electrical resistance 13 has been overheated during the preceding packaging operations, the air flow coming out of chamber 3 ensures the resistance cooling and, more generally, cooling of the means 10 for the container sealing.

[0048] When the desired vacuum degree is reached in the vacuum chamber 3, the second valve 39 is switched over so that it can bring the control chamber 20 into communication with the surrounding atmosphere. Thus a pressure difference is created between the control chamber 20 and the vacuum chamber 3. This difference causes an upward displacement of the movable portion 20a. Movement of the movable portion 20a, in turn, brings the electrical resistance 13 to the active condition. In this condition the resistance 13 presses the portion of the envelope to be heat sealed against the counter-bar 18.

[0049] Concurrently with switching over of the second valve 39, the electrical resistance 13 is activated and power supplied over a previously set period of time, so as to cause a correct heat sealing of the opposite flaps of the container in the form of an envelope along the open side thereof.

[0050] This interval of time, possibly adjustable by means of a timer, can be conveniently selected depending on the type of material of which the container is made (PE-PA (polyethylene-polyamid) or aluminium with PE-PA), through control push-buttons denoted by 40a and

40b respectively in Fig. 3 and connected with respective timing circuits each of them being set based on a respective supply time for the electrical resistance 13.

[0051] When heat sealing has been completed, the first valve 38 is switched over so that it brings the main air duct 22 into communication with the surrounding atmosphere.

[0052] Then a new air flow enters the pre-chamber 3a and, therefore, the vacuum chamber 3 through the air path of travel 21. This flow causes cooling of both the electrical resistance 13 and the envelope portion that has been heat sealed.

[0053] Once the atmospheric pressure has been restored within the vacuum chamber 3, the upper shell half 7 can be lifted to enable extraction of the container holding the vacuum packaged foods.

[0054] For carrying out packaging of food in containers external to the vacuum chamber 3, it is merely necessary to operate the pump by the control push-button 40, while keeping the upper shell half 7 in an open condition, after engaging the connecting element of a flexible tube in the suction end piece 28, said flexible tube, at its opposite end, being connected with the container inside which the vacuum is wished to be created.

[0055] The invention achieves important advantages.

[0056] First of all the apparatus of the invention ensures an optimal heat sealing of the food container, even when several consecutive packaging operations are carried out.

[0057] This result is achieved by virtue of the fact that the air flow entering and going out of the vacuum chamber 3 lightly touches the container-sealing means thereby causing cooling of same.

[0058] Another advantage of the invention resides in that, at the end of the packaging process, a container holding vacuum packaged foods is provided which can be immediately handled without requiring particular precautions. In fact, the apparatus of the invention ensures that the container portion just heat sealed will be brought to a temperature close to the room temperature before the container is drawn out of the packaging device. This also enables the container to recover its normal physical properties, thereby avoiding the risk of easy tearing, due to loss of toughness, of portions that are at high temperature.

Claims

1. An apparatus for the vacuum packaging of food, comprising:

   - a vacuum chamber (3) to receive a container for the food to be vacuum packaged, said container having at least one heat-sealable portion;
   - means (10) for sealing the container by heat seal, which means is active within the vacuum chamber (3); and
   - pneumatic means operatively active in the chamber (3) to move the air between the outside and the inside of the chamber itself (3) along at least one air path of travel (21);

   characterized in that said air path of travel (21) lightly touches the sealing means (10) of the container.

2. An apparatus as claimed in claim 1, wherein said air path of travel (21) extends at least partly along a main air duct (22), said means (10) for sealing the container by heat seal being located close to the main air duct (22).

3. An apparatus as claimed in claim 2, wherein said sealing means (10) for the container comprises a support (12) and an electrical resistance (13) mounted on said support (12).

4. An apparatus as claimed in claim 3, wherein the main air duct (22) is formed at least partly within said support (12).

5. An apparatus as claimed in claim 3, wherein the electrical resistance (13) defines at least one confining wall for said main air duct (22).

6. An apparatus as claimed in claim 3, wherein said electrical resistance (13) can be switched over between an active condition in which it abuts by pressure against the heat-sealable portion of the container and an inactive condition in which it does not exert any pressure on the container, said apparatus (1) further comprising means (17) for switching over the electrical resistance (13) between the active and inactive conditions.

7. An apparatus as claimed in claim 3, **characterized in that** said sealing means (10) for the container comprises a counter-bar (18) mounted within the vacuum chamber, and **in that** the electrical resistance (13), when it is in the active condition, presses the heat-sealable portion of the container against said counter-bar (18).

8. An apparatus as claimed in claim 6, wherein said switching over means (17) for the electrical resistance (13) comprises a pneumatic actuator (19).

9. An apparatus as claimed in claim 8, wherein the pneumatic actuator (19) comprises a control chamber (20) of a varying volume depending on a pressure difference between the control chamber (20) and the vacuum chamber (3) .

10. An apparatus as claimed in claim 9, wherein the

control chamber (20) has a movable portion (20a), preferably consisting of a deformable diaphragm, said support (12) being mounted on said movable portion (20a).

11. An apparatus as claimed in claim 2, wherein the pneumatic means comprises:

- a pump (37) connected with the main air duct (22) to draw air out of the vacuum chamber (3),
- a first valve (38) active on the main air duct (22) and susceptible of being switched over between a first operating condition in which it brings the duct (22) into communication with the pump (37) and a second operating condition in which it brings the duct (22) into communication with the surrounding atmosphere.

12. An apparatus as claimed in claim 8, wherein the pneumatic means comprises:

- a pump (37) connected with the main air duct (22) to draw air out of the vacuum chamber (3);
- a secondary air duct (26) bringing said pneumatic actuator (19) into communication with a second valve (39) susceptible of being switched over between a first operating condition in which it brings the secondary duct (26) into communication with the pump (37) and a second condition in which it brings the secondary duct (26) into communication with the surrounding atmosphere.

13. An apparatus as claimed in claim 1, wherein the air path of travel (21) lightly touches a container region close to the portion to be heat sealed.

14. An apparatus as claimed in claim 2, wherein one of the ends of the main air duct (22) is located close to the heat sealable portion of the container.

15. An apparatus as claimed in claim 2, further comprising a holding framework (29) delimiting, in said vacuum chamber, a pre-chamber (3a) in communication with the vacuum chamber via the main air duct (22).

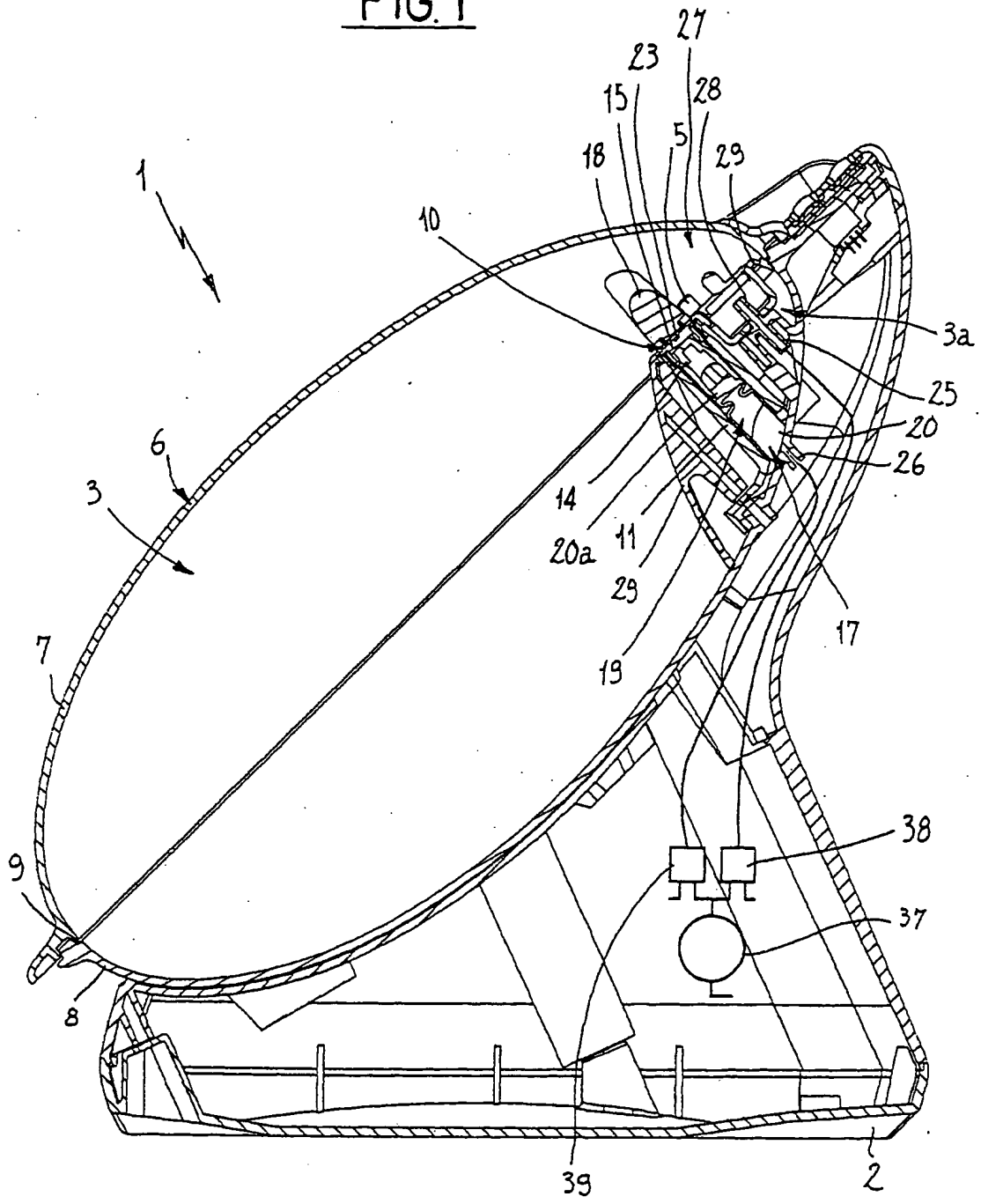
16. An apparatus as claimed in claim 1, further comprising means (27) for creating the vacuum in containers external to the vacuum chamber (3).

17. An apparatus as claimed in claim 15, further comprising means (27) for creating the vacuum in containers external to the vacuum chamber (3), said means (27) comprising a suction end piece which is located within the pre-chamber (3a) and is accessible through a connecting opening (31) arranged in the holding framework (29) and provided with a small cover that can be opened (32).

18. An apparatus as claimed in claim 1, further comprising a base (2) carrying said vacuum chamber (3) and having a horizontal rest surface (2a), said vacuum chamber having an inclined extension direction with respect to the horizontal rest surface (2a).

19. An apparatus as claimed in claim 3, wherein said sealing means (10) further comprises at least one film (13a) of heat-resistant material covering the electrical resistance (13), said film having respectively opposite ends each in engagement with a hooking element (33, 34) which is fixed with respect to the electrical resistance (13).

FIG. 1



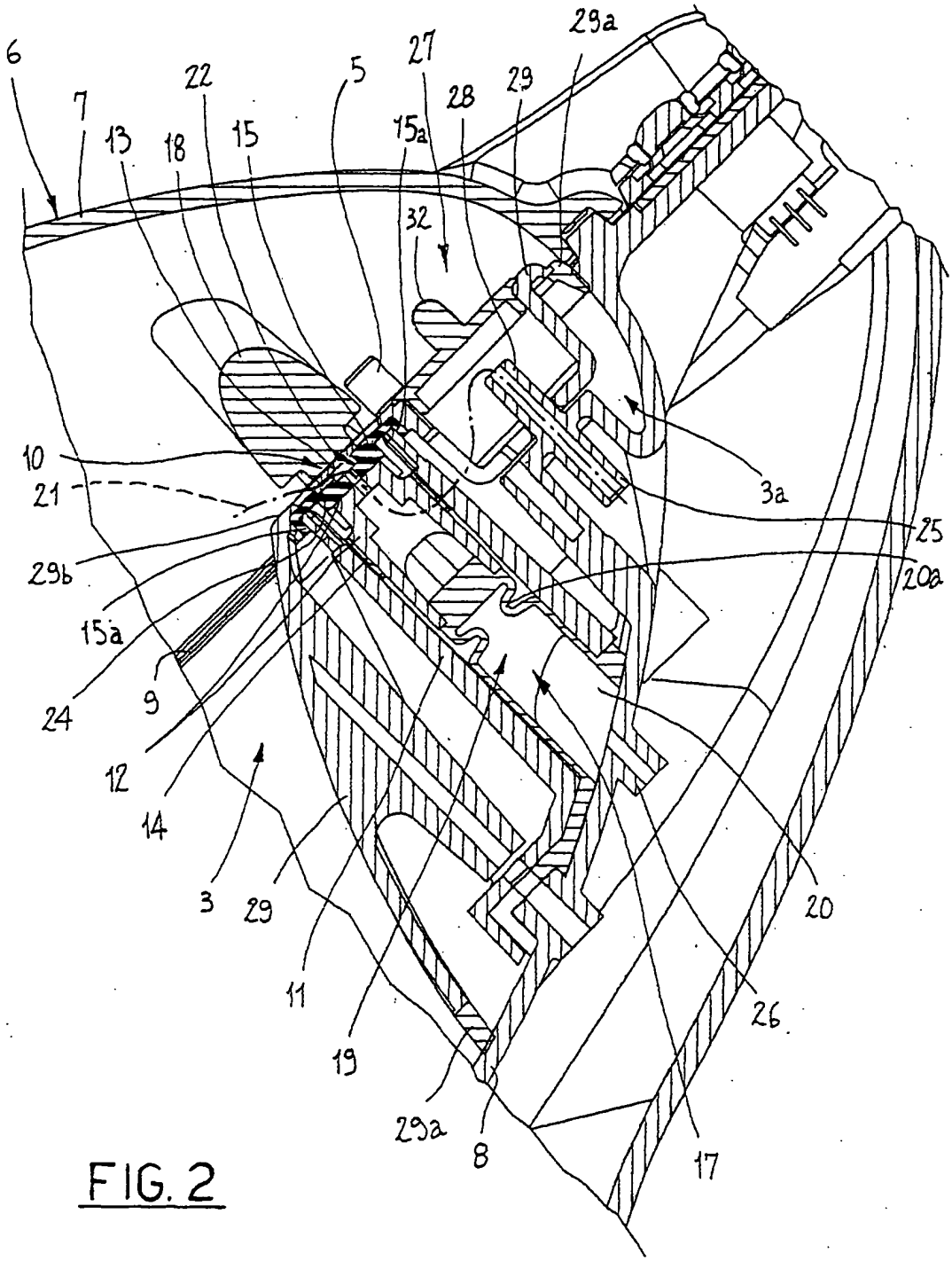
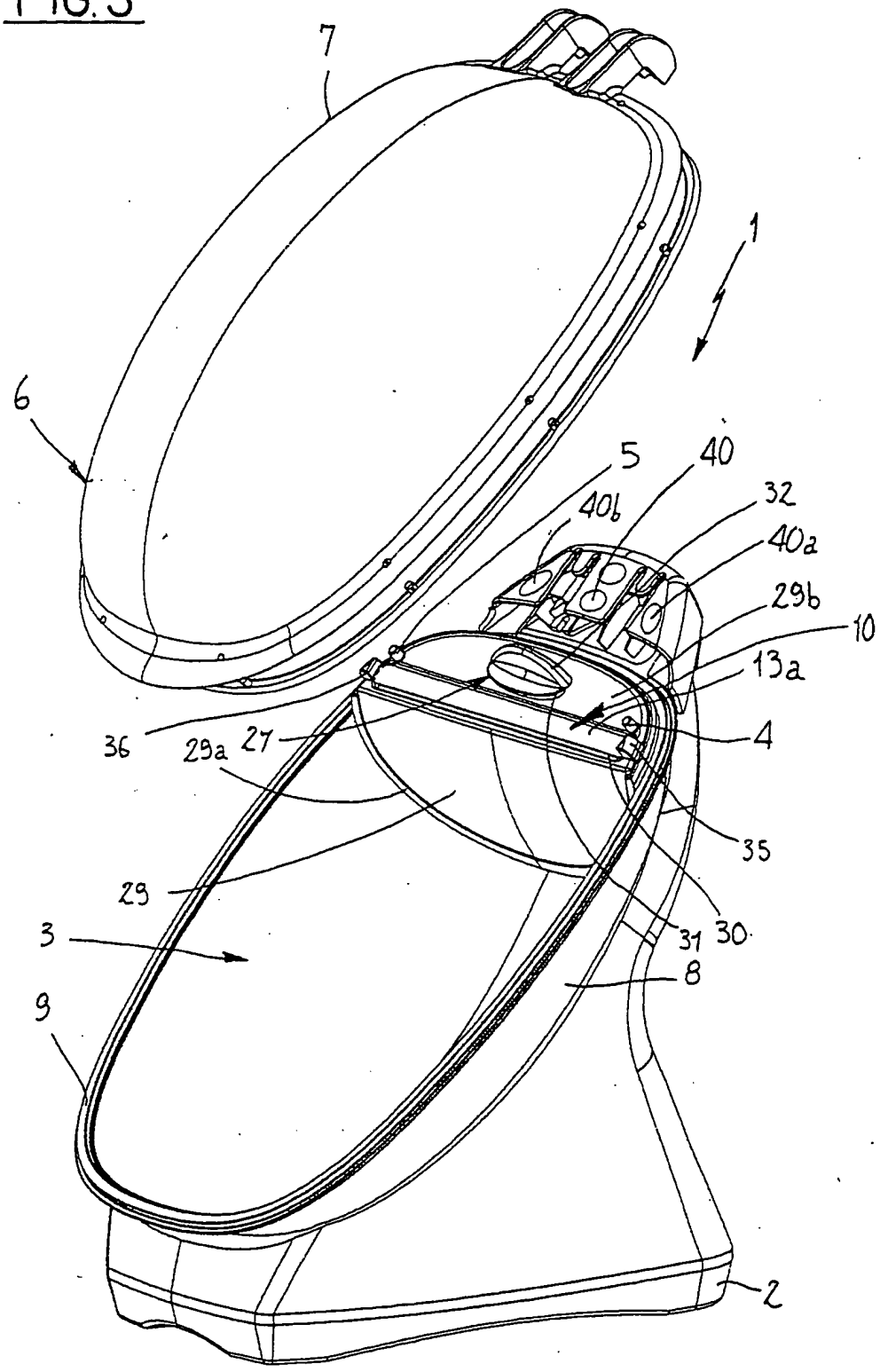

6
7
13
18
22
15
5
27
15a
28
29
29a
32
10
21
29b
15a
24
9
12
14
3
29
11
19
29a
8
17
26
20
3a
25
20a

FIG. 2

FIG. 3



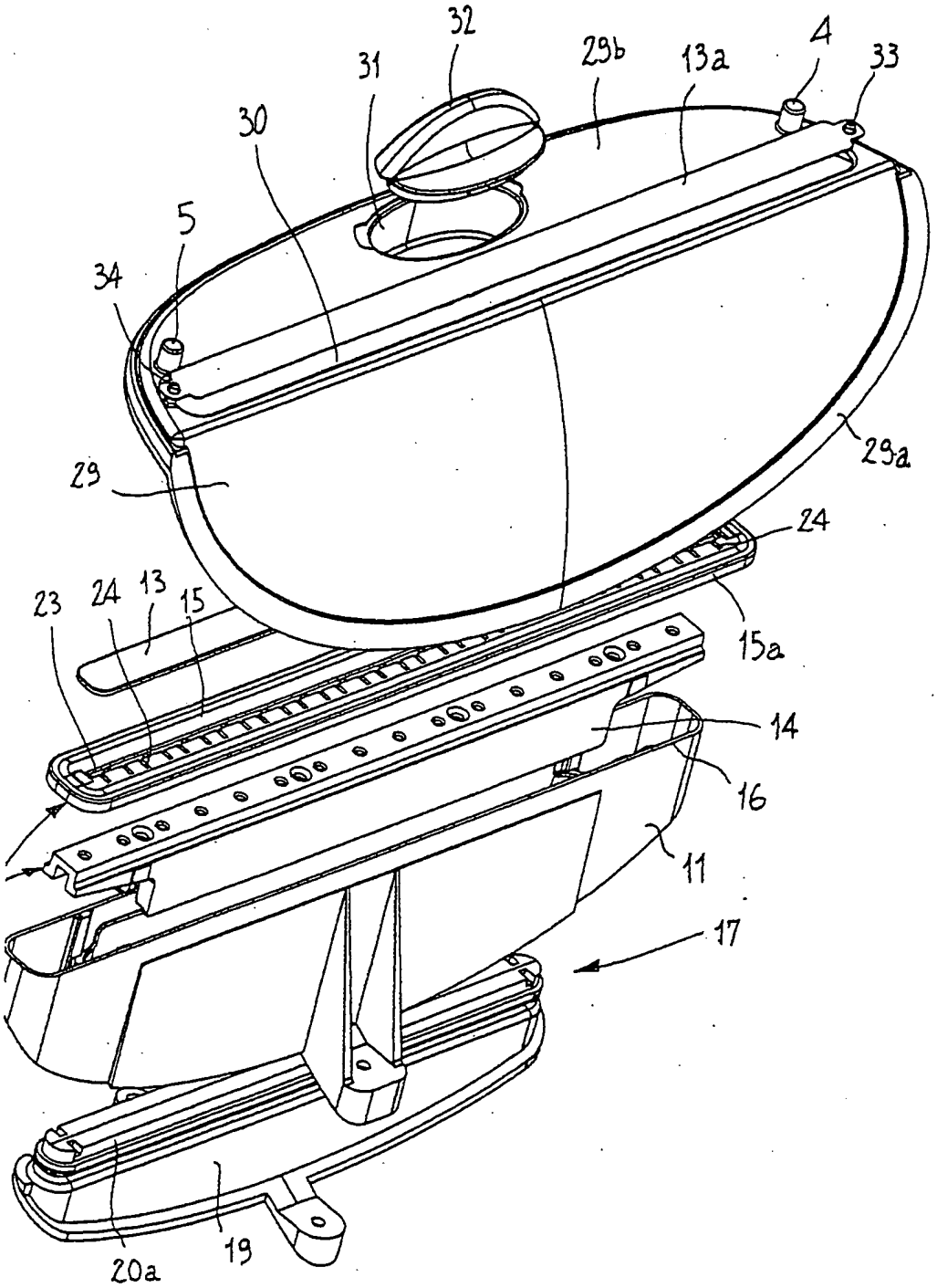
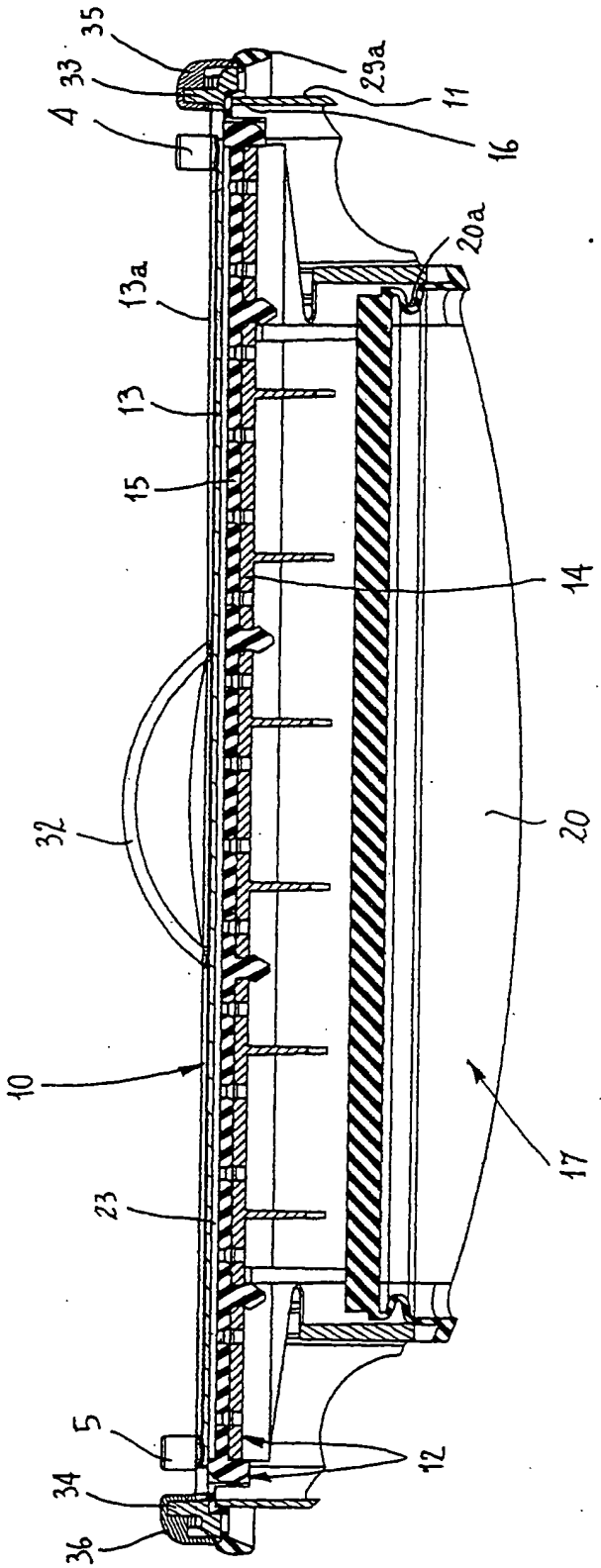


FIG.4

FIG. 5



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0305

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X A	GB 1 284 509 A (GRACE) 9 August 1972 (1972-08-09) * the whole document *	1-3,13, 14,16 7-9	B65B31/02

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 September 2000	Claeys, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 83 0305

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-09-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1284509 A	09-08-1972	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82